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SUITABILITY OF DYES FROM PEANUT POD ON DIFFERENT FABRICS USING COPPER SULPHATE MORDANTING AGENT

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ABSTRACT

These days, interest for natural dyes has been becoming quickly because of expanded mindfulness on perilous, poisonous and unfavourably susceptible responses connected with synthetic dyes. Natural dyes are gotten from natural sources, for example, plants, creepy crawlies and minerals. Among all the plant based colour sources i.e. leaves, seeds, blossoms and so on. Seeds colour sources are more vital for material colouring as it gives colour. In this manner by keeping in perspective of above, in the present work, the peanut units were utilized for the extraction of colour, colouring of the chose textures at upgraded conditions. Natural dye from shelled nut cases was removed by watery strategy and utilized for colouring diverse textures utilizing copper sulphate mordanting agent. Textures were scoured was cut into little textures (8 x 10 cm). Mordanting techniques like Post-mordanting strategy was utilized amid the colouring of the pretreated diverse textures. It is apparent that natural dyes from the peanut units can viably be utilized for colouring distinctive textures. This is on account of good shading shades were recorded with the severe utilized. The resultant shading speed of the chose coloured specimens to washing, rubbing, and daylight with seven textures as Cotton, Linen, Jute, Cotton Jute, Satin, Silk and Polyester is tested and different shades of dye is analyzed.

KEYWORDS: Natural Dyes, Fabric, Dye, Dye Process, Copper Sulphate, Eco-Friendly, Textile Chemistry, Mordant

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Original Article

1. INTRODUCTION

Natural dyes include colourants that are acquired from creature, minerals and vegetable matter without and synthetic preparing. A recharged universal intrigue has emerged in normal colours because of expanded familiarity with the natural and wellbeing risk connected with the combination, handling and utilization of engineered colours [1-3]. Characteristic colours got from plants have as of late increased monetary favourable position over engineered colours as a result of their non-dangerous and biodegradable nature [4, 5]. In any case, concentrates on have demonstrated that specific natural colours may have distinguishable mutagenic impacts e.g. elderberry shading and safflower yellow; others like carmine, can bring about asthma by constant inward breath, however one might say that the greater part of the natural colours are sheltered and some even have healing impact e.g. curcumin in turmeric has antibacterial properties [6, 7].

The issue connected with the utilization of natural dyes is the, poor shading quickness, absence of reproducibility and absence of splendor in shading created. They in this way require concoction species called mordants for restricting the colour to textures to enhance shading quickness. Mordants help in authoritative of colours to texture by framing a compound extension from colour to fiber subsequently enhancing the recolouring capacity of a colour with expanding its speed properties [8-10].

In Uganda, silk cultivating otherwise called Sericulture is a practice ordinarily grasped by the neighbourhood agriculturists in the Focal, Western and Eastern parts of the nation. Silk is a characteristic protein fiber delivered by silk worms. The silk is delivered by nourishing of silk worms on mulberry leaves to create covers and the cases are inevitably handled into the silk strings which are a wellspring of astounding material fiber in like manner to this we have additionally learned about the some different textures as Cotton, Cloth, Jute, Fleece, Cotton Jute and Polyester [11, 12].

Therefore by keeping in perspective of over, the present study has been embraced in order to resuscitate the deep rooted range of colouring with normal colours. In the present work, the shelled nut units were utilized for the extraction of colour, colouring of the chose textures at improved conditions, utilizing copper sulphate severe and assess the resultant shading quickness of the coloured examples to washing, rubbing, and daylight would upgrade the execution in customary occupations and the scholarly development, is required in today's opportunity [13].

As of late, various business dyers and little material fare houses have begun taking a gander at the potential outcomes of utilizing normal colours for consistent premise colouring and printing of materials to defeat natural contamination brought about by the engineered colours [14-16].

2. ABOUT NATURAL DYES

The word 'natural dye' covers every one of the colours got from the normal sources like plants, creature and minerals. Natural colours are for the most part non-substantive and must be connected on materials by the assistance of mordants, more often than not a metallic salt, having a liking for both the shading matter and the fiber [17]. Move metal particles normally have solid co-ordinating power as well as fit for shaping week to medium fascination/communication strengths and in this way can go about as spanning material to make substantivity of regular colours/colourants when a material being impregnated with such copper sulphate (i.e. mordanted) is subjected to colouring with shelled nut case characteristic colours, for the most part having some mordantable gatherings encouraging obsession of such colour/colourant. These metallic mordants in the wake of consolidating with colour in the fiber, it frames an insoluble encourage or lake and in this way both the colour and severe get settled to wind up wash quick to a sensible level.

2.1 Natural Dyes Advantages and Disadvantages

The In the late years, there has been a pattern to restore the craft of characteristic colouring. This is basically on the grounds that in a few viewpoints characteristic colourants are worthwhile against engineered colours. Some of these focal points alongside a few restrictions (disadvantages) are recorded below [18-20]:

2.1.1 Natural Dyes Advantages

- The shades created by natural colours/colourants are normally delicate, brilliant and mitigating to the human eye.
- Natural dyestuff can create an extensive variety of hues by blend and match framework. A little variety in the colouring method or the utilization of various mordants with a similar colour (polygenetic sort normal colour) can move the hues to a wide range or make absolutely new hues, which are not effectively conceivable with manufactured dyestuffs.
- Natural dyestuffs create uncommon shading thoughts and are consequently orchestrating.
- Unlike non-renewable essential crude materials for manufactured colours, the natural colours are typically

renewable, being agro-renewable/vegetable based and in the meantime biodegradable.

- In a few cases like harda, indigo and so forth. The waste in the process turns into a perfect manure for use in agrarian fields. In this way, no transfer issue of this characteristic waste.
- Many plants blossom with badlands. Along these lines, no man's land use is an additional value of the characteristic colours. Colours like madder develop as host in tea gardens. So there is no extra cost or exertion required to develop it.
- This is a work serious industry, in this way giving openings for work to every one of those occupied with development, extraction and utilization of these colours on material/sustenance/cowhide and so on.
- Application of natural colours can possibly gain carbon credit by diminishing utilization of fossil fuel (petroleum) based engineered colours.
- Some of its constituents are against allergens, henceforth demonstrate alright for skin contact and are for the most part non-dangerous to human wellbeing.
- Some of the natural colours are upgraded with age, while manufactured colours blur with time.
- Natural colours drain yet don't recolour different textures, turmeric being a special case.
- Natural colours are generally moth verification and can supplant manufactured colours in children articles of clothing and nourishment stuffs for wellbeing. In spite of these points of interest, regular colours do convey some natural hindrances, which are in charge of the decrease of this antiquated craft of colouring materials.

2.1.2 Natural Dyes Disadvantages

- It is hard to duplicate shades by utilizing characteristic colours/colourants, as these agroproducts shift starting with one harvest season then onto the next yield season, place to place and species to species, development period and so forth.
- It is hard to institutionalize a formula for the utilization of normal colours, as the natural colouring procedure and its shading advancement depends on shading part as well as on materials.
- Natural colouring requires gifted workmanship and is accordingly costly. Low shading yield of source normal colours subsequently requires the utilization of more dyestuffs, bigger colouring time and overabundance cost for mordants and mordanting.
- Scientific reinforcement of a substantial part of the science required in normal colouring is still should be investigated.
- Lack of accessibility of exact specialized information on extraction and colouring methods.
- The coloured material may change shading when presented to the sun, sweat and air.
- Nearly all-regular colours with a couple of exemptions require the utilization of mordants to settle them on to the material substrate. While colouring, a considerable part of the severe stays unexhausted in the lingering colour shower and may posture genuine gushing transfer issue.

- With a couple of special cases, a large portion of the regular colours are criminal notwithstanding when connected in conjunction with a stringent. Thusly, here and there their shading quickness execution evaluations are deficient for cutting edge material use.

3. MATERIALS AND METHODS

3.1 Source

The first part of this research work was to get the peanut pods. For this research work peanut pod were collected from local market of Beawar, Ajmer City, Rajasthan and India and then classified it into two segments, dark and light colour peanut pod then after this peanut pod were dried into non sunlight area as shown in Figure 1. After dried we grind them into mixer grinder. Preparation of the dye bath for dyeing using natural dye involves crushing, soaking and boiling are usually necessary to extract the dye from the vegetable matter. In general the coarser the material, the longer it should be soaked and boiled [21]. In the process of crushing, grinder is used to make it in the powder form. When the powder form is ready, it is mixed with water solvent and heated on gas burner to extract the dye. The dyeing of cotton and other fabrics was carried out in three stages; Extraction of dyes from the plant sources, Mordanting and Dyeing.

3.2 Growing and Cultivation

The peanut is developed as a yearly yield. It can grow up to 21/2 feet (75 centimeters) high and from 3 to 4 feet (90 to 120 centimeters) over. Shelled nut plants run in sort from group plants to runner plants6-8. Group plants develop upright. Runner plants spread out on or close to the ground as they develop as appeared in Figure 1. Shelled nut plant develops best in light, very much depleted and sandy soil. They require much daylight, warm temperature, direct precipitation, and an ice free developing time of four or five months. Ranchers set up the dirt by furrowing it profoundly and altogether. Free soil is imperative so that the pegs can infiltrate the dirt effectively. Agriculturists plant nut seeds 2" to 3" (5 to 8 centimeters) profound at interims of 3" to 6" (8 to 15 centimeters), and in lines 24" to 36" (60 to 90 centimeters) separated.

3.3 Extraction of Dye

Different investigations were led for the greatest extraction of natural colour from nut units. The specimens were gathered and washed altogether with water to expel any soil [21]. After intensive drying at room temperature, the specimens were ground into powder with the assistance of processor and the powdered examples were utilized for the extraction of colours. So as to discover the ideal extraction conditions, tests were led in watery extraction at 80°C temperature with M: L: R proportion 1:10.

3.4 Mordanting

A few dyes can be applied by any of 3 methods (pre, simultaneous and post) but generally one of the processes gives better results than the other in case of most of dyes.

- Mordant:- copper sulphate CuSo4
- Optimization of mordant concentration:-10% concentration of mordant was used. The mordanting was done and samples were dyed employing extraction time, dye, dyeing time, dyeing temperature. Optimum mordant concentration was decided on the basis of evenness, brightness and darkness of the colour [22].

Mordanting was carried out in the Post-mordanting

3.4.1 Post-Mordanting

It consists of simple dyeing and since the lake is not formed at this stage, perfect penetration of dye takes place. The subsequent mordanting fixed the dye through lake formation.

4. DYEING

The fabrics dyed with dye extract, keeping material it liquor ratio at 1:50 at 80°C boiling temperature for 75 min. finally the samples were washed thoroughly with cold water, squeezed and dried.

4.1 Colour Fastness of Dyed Sample

Fastness: Ability of dye to retain the colour after exposure to sun, perspiration, atmosphere, washing or other colour destroying agent. The colour fastness of dye is very important from practical point of view for the manufacturer as well as consumer. It is essential to ensure that fastness of colour is sufficient to meet general and particular requirements. Colour fastness is term used for the degree to which dye holds fast to the fiber or fabrics. A good or high fastness means that they does not fad in light, bleed or rush in washing, crock or rub off in wear [23]. The following standard materials are needed for carrying out that test or for assessing colour fastness ratings [1, 14].

Gray scales for evaluating change in colour (IS768:1982)

It is a step scale which illustrates colour differences corresponding rating 5, 4, 3, 2 and 1. This scale may be augment to 9 step scales by the provisions of half step fastness rating 4-5,3-4,2-3and 1-2.

Gray scale for evaluating staining (IS 769:1982)

It is also a step which illustrates the contrasts or perceived colour difference corresponding to fastness rating 5, 4, 3, 2 and 1.this scale by the provisions of half step fastness rating 4-5, 3-4, 2-3and 1-2.

4.2 Determination of the Colourfastness of Dyed Samples

Colourfastness to Washing

BS1006, (03:1987, IS 03) was used. A specimen measuring 10cm×4cm of the material to be tested was cut out. Then specimen was placed between two pieces of undyed fabric measuring 10×4 cm and the three pieces were held together by stitching round the edges.

5. RESULT FOR COLOURFASTNESS ON DIFFERENT FABRIC WITH PEANUT POD AND MORDANTS

Good colour fastness continues to be major concern of the consumers. Beauty of colour on any fabric is of no value to consumer unless the dye is considered fast under conditions, it will be used, [24] and that's why in this study colourfastness of different chemicals on different fabrics was assessed. The fabrics are as follows: Cotton, Linen and Jute. The above discussed points can be understood by different analysis with five point gray scale, which is given by the four different tables.

Table 1: Cotton Fabric with Copper Sulphate Post Mordanting Condition

Fabric	Specimen	Dye & Mordant	Dye %	Mordanting	Colour Change Sun Light	Colour Change Rubbing (Wet)	Colour Change Rubbing (Dry)	Colour Change Washing Fastness
Cotton		Peanut Pods (pp)	-	-				
	1	PP+ Copper Sulphate	10%	Post	4/5	4	4/5	4
	2	PP+ Copper Sulphate	15%	post	4	4/5	4/5	4/5

Table no. 1 - shows that cotton fabric with copper sulphate mordant in post mordanting condition. It was observed that very good results obtained with pea nut pod natural dye 15% with all test while good to very good results were shows with pea nut pod natural dye 10%.

Table 2: Linen Fabric with Copper Sulphate in Post Mordanting Condition

Fabric	Specimen	Dye & Mordant	Dye %	Mordanting	Colour Change Sun Light	Colour Change Rubbing (Wet)	Colour Change Rubbing (Dry)	Colour Change Washing Fastness
Linen		Peanut Pods (pp)	-	-				
	1	PP+ Copper Sulphate	10%	Post	4/5	5	5	4
	2	PP+ Copper Sulphate	15%	post	5	5	5	4/5

Table no. 2- it was observed from the table that linen fabric with 10% &15% of dye in post mordanting condition .linen fabric shows very good to excellent colourfastness.

Table 3: Jute Fabric with Copper Sulphate in Post Mordanting Condition

Fabric	Specimen	Dye & Mordant	Dye %	Mordanting	Colour Change Sun Light	Colour Change Rubbing (Wet)	Colour Change Rubbing (Dry)	Colour Change Washing Fastness
Jute		Peanut Pods (pp)	-	-				
	1	PP+ Copper Sulphate	10%	Post	4/5	4	4/5	4/5
	2	PP+ Copper Sulphate	15%	post	4/5	4/5	4/5	4/5

Table no. 3 - shows that Jute fabric with Copper Sulphate in Post mordanting condition. A very good result was found in case of all tests with 10% & 15% natural peanut pod dye.

Table 4: Silk Fabric with Copper Sulphate in Post Mordanting Condition

Fabric	Specimen	Dye & Mordant	Dye %	Mordanting	Colour Change Sun Light	Colour Change Rubbing (Wet)	Colour Change Rubbing (Dry)	Colour Change Washing Fastness
Silk		Peanut Pods (pp)	-	-				
	1	PP+ Copper Sulphate	10%	Post	4/5	4	4/5	4
	2	PP+ Copper Sulphate	15%	post	4	4/5	4/5	4

Table no. 4 - it was observed from the table that colourfastness with Silk fabric. It was found that Copper Sulphate in Post mordanting condition shows good to very good results with 15% dye in all tests.

Table 5: Cotton/Jute Fabric with Copper Sulphate in Post Mordanting Condition

Fabric	Specimen	Dye & Mordant	Dye %	Mordanting	Colour Change Sun Light	Colour Change Rubbing (Wet)	Colour Change Rubbing (Dry)	Colour Change Washing Fastness
Cotton/ Jute		Peanut Pods (pp)	-	-				
	1	PP+ Copper Sulphate	10%	Post	3/4	4	4/5	4
	2	PP+ Copper Sulphate	15%	post	4	4/5	4/5	4

Table no. 5- shows that cotton/jute fabric with copper sulphate mordant in post mordanting condition. It was observed that very good results obtained with pea nut pod natural dye 15% with all test while moderate to very good results were shows with pea nut pod natural dye 10%.

Table 6: Satin Fabric with Copper Sulphate in Post Mordanting Condition

Fabric	Specimen	Dye & Mordant	Dye %	Mordanting	Colour Change Sun Light	Colour Change Rubbing (Wet)	Colour Change Rubbing (Dry)	Colour Change Washing Fastness
Satin		Peanut Pods (pp)	-	-				
	1	PP+ Copper Sulphate	10%	Post	4/5	4/5	4/5	4/5
	2	PP+ Copper Sulphate	15%	post	4/5	4	4/5	4

Table no. 6 - shows that satin fabric with Copper Sulphate in Post mordanting condition. Good to very good results was found in case of all tests with 10% & 15% natural peanut pod dye.

Table 7: Polyester Fabric with Copper Sulphate in Post Mordanting Condition

Fabric	Specimen	Dye & Mordant	Dye %	Mordanting	Colour Change Sun Light	Colour Change Rubbing (Wet)	Colour Change Rubbing (Dry)	Colour Change Washing Fastness
Polyester		Peanut Pods (pp)	-	-				
	1	PP+ Copper Sulphate	10%	Post	4	4	4/5	4
	2	PP+ Copper Sulphate	15%	post	3/4	4/5	4/5	4/5

Table no. 7 - shows that polyester fabric with copper sulphate mordant in post mordanting condition. It was observed that good to very good results obtained with pea nut pod natural dye 10% with all test while moderate to very good results were shows with pea nut pod natural dye 15%.

Figure 1: Colours produced on all Seven Fabrics on Application of Peanut Pod Dyes with 10% of Copper Sulphate Mordants in Post Mordanting Process

Figure 2: Colours Produced on all Seven Fabrics on Application of Peanut Pod Dyes with 15% of Copper Sulphate Mordants in Post Mordanting Process

6. CONCLUSIONS

Overall results observed that linen fabric shows excellent result with sunlight and rubbing (wet & dry) tests with 15% of dye. Cotton fabric gave excellent colourfastness with copper sulphate mordant in all tests. Linen Jute, silk and satin fabrics shows good to very good results with 10 % & 15% natural peanut pod dye. Cotton/jute and polyester fabrics shows moderate to very good results.

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8. REFERENCES

1. *Char, W.P. (1983). A revision of the Hawaiian species of Sesbania (Leguminosae). M.Sc. thesis, Univ. of Hawaii, Hawaii, USA.*
2. *Mehta Pradip V. and Bhardwaj Satish K., (1998). Managing Quality in the Apparel Industry, New Age International Publishers, 189-193.*
3. *P.K.Ganguly, A.K.Samanta. et al (1989). Some studies of cross-linking on Jute Fabric with different preparatory routes, Colourage, 36, P-19.*
4. *Bhuyan R, Saikia CN (2008). Extraction of Natural colourants from roots of Morinda angustifolia Roxb. Their identification and studies of dyeing characteristics on wool. Ind. J. Chem. Technol., 10(2): 131-136.*
5. *Samanta, A. K. and Agrawal, P. (2009). Application of Natural Dyes on Textiles. Indian Journal of Fibre & Textile Research, 34: 384-389.*
6. *Young-Hee L, Han-Do K (2004). Dyeing properties and Colourfastness of Cotton and Silk fabrics dyed with Cassia tora L. extract. Fibres Polymers, 5(4): 303-308.*
7. *A. K. Samanta, D.N.Sharma. (1990). Some studies on chlorination of poly propylene, Colourage, 37, P-15.*

8. *Padma SV, Rakhi S (2007). Dyeing wool and silk with Hibiscus mutabilis (Gulzuba). Dyes Pigments, 74(2): 464-469.*
9. *A.K.Samanta, D. Sur, P.K. Ganguly & A. Chowdhury. (1990). Some studies on mechanical properties and acid dye uptake of solvent treated Nylon-6 filaments, Journal of Man-Made Textiles in India, P-119.*
10. *A.K.Samanta, P.Chakraborty, D.Das. (1990). Some studies on quality performances of Jute/ Cotton furnishing fabrics, Journal of Institution of Engineers- Textile Engineering, 71, P-45.*
11. *A.K.Samanta, D.Das. (1992). Studies on Quantitative colour measurement of direct dyed Jute Fabric in relation to computerized colour matching, Journal of Institution of Engineers-Textile Engineering 73, P-53.*
12. *P.Ghosh, A.K.Samanta, D.Das. (1994). Effect of selective pretreatments and different resin post-treatments on Jute/ Viscose upholstery fabric, Indian Journal of Fibre & Textile Research, 19, P-277.*
13. *A.K.Samanta, D.Sur, D.P.Chattopadhyay, S.K.Ghosh et al. (1995). Some studies on mechanical properties and atmospheric dyeing of solvent pretreated polyester multifilament yarn, Indian Journal of Fibre & Textile Research, 20, P-23.*
14. *AATCC Technical manual (2008). American Association of Textile Chemists and Colourists, Vol: 83.*
15. *Adeel, S., Ali S., Bhatti, I.A. and Zsila, F. (2009). Dyeing of Cotton fabric using Pomegranat (Punica Granatum) Aqueous extract, Asian J. Chem., 21(5): 3493-3499.*
16. *Cardon Dominique (2010). Natural Dyes, Our Global Heritage of Colours, Textile Society of America Symposium Proceedings, Textile Society of America.*
17. *Deo, H.T., Desai, B.K. (2006). Dyeing of cotton and jute with tea as natural dye, Colourage, 48: 33-38.*
18. *Duke, J.A. (1981). Handbook of legumes of world economic importance, Plenum Press, New York.*
19. *Jothi, D. (2008). Extraction of natural dyes from African Marigold flower (Tagetus Erecta) for Textile colouration, AUTEX journal, 8(2).*
20. *Kale Sunita, Naik Sangita and Dheodhar Sucheta (2007). Cosmos flowers – An effective source of natural dye for wool, Journal of Textile Association, 164-167.*
21. *Kamel, M.M., Hemly, H.M. and Hawary, N.S. (2009). Some Studies on Dyeing properties of Cotton fabrics with Crocus Sativus (Saffron) flowers using an Ultrasonic method, AUTEX Research Journal, 9 (1).*
22. *Kulkarni, S.S., Gokhale, A.V, Bodake, U.M, Pathade, G.R, (2011). Cotton dyeing with Natural dye extracted from Pomegranate (Punicagranatum) peel, UJERT journal, 1 (2):135- 139.*
23. *Vankar Padma S., Shanker Rakhi, Srivastava Jyoti,(2007). Ultrasonic dyeing of cotton fabric with aqueous extract of Eclipta alba, Dyes and Pigments, 72: 33-37.*
24. *Vankar, P., Shanker, R., Samudrika W. (2009). Utlizatation of temple waste flower – Tagetus erecta for dyeing of cotton, wool and silk on industrial scale, Journal of textile and Apparel, Technology and Management, 6: 1-15.*